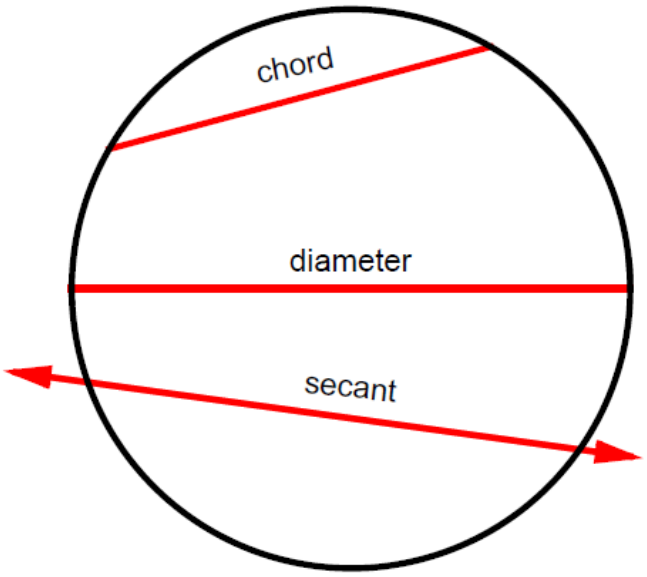
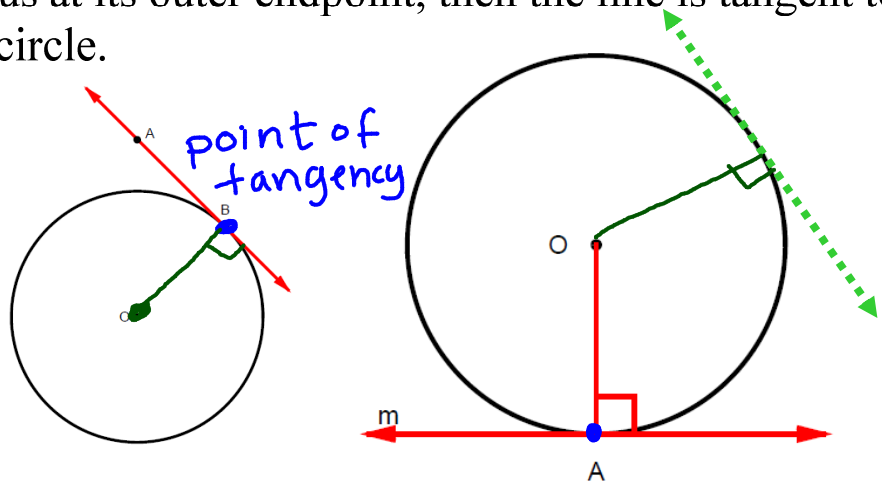
Tangents and Secants

A **secant** is a line that contains a chord.

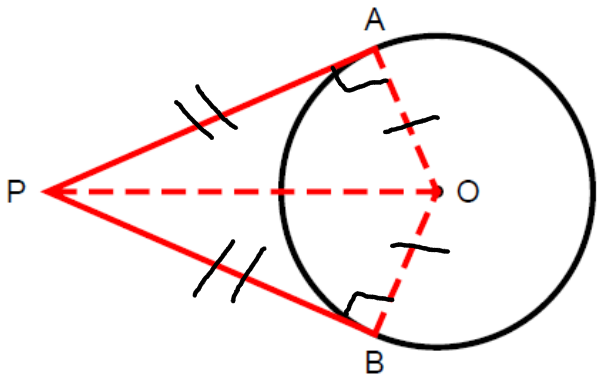


A **tangent** to a circle is a line in the plane of a circle that intersects the circle in exactly one point, called the **point of tangency**.

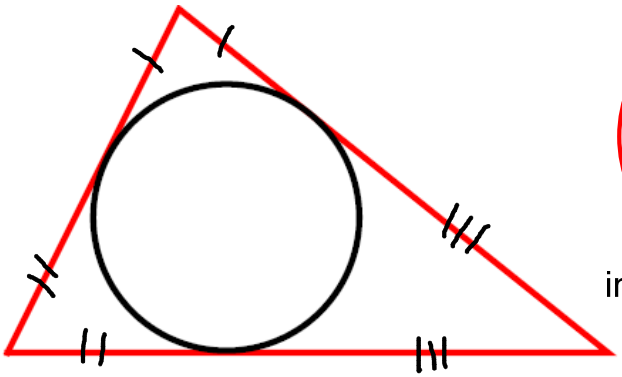
If a line in the plane of a circle is perpendicular to a radius at its outer endpoint, then the line is tangent to the circle.



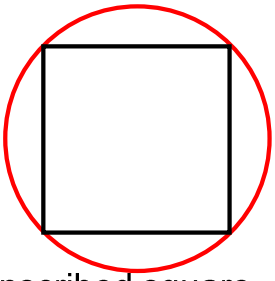
Tangents to a circle from a point are congruent.



When each side of a polygon is tangent to a circle, the polygon is said to be **circumscribed about the circle** and the **circle is inscribed in the polygon.**



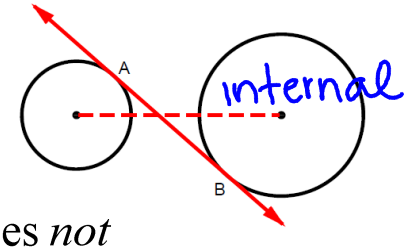
Inscribed circle
Circumscribed triangle



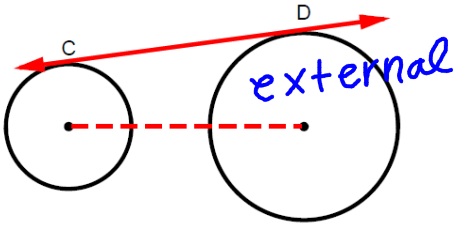
inscribed square
circumscribed circle

A line that is tangent to each of two coplanar circles is called a **common tangent**.

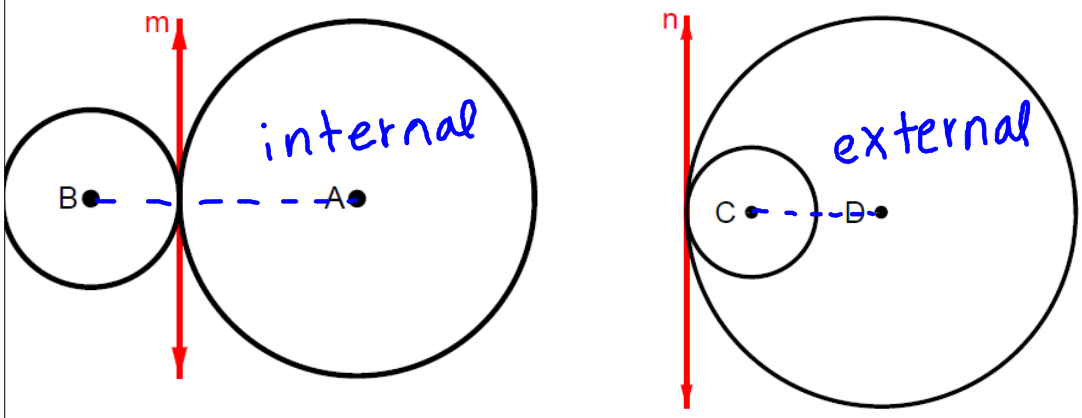
A common *internal* tangent intersects the segment joining the centers.



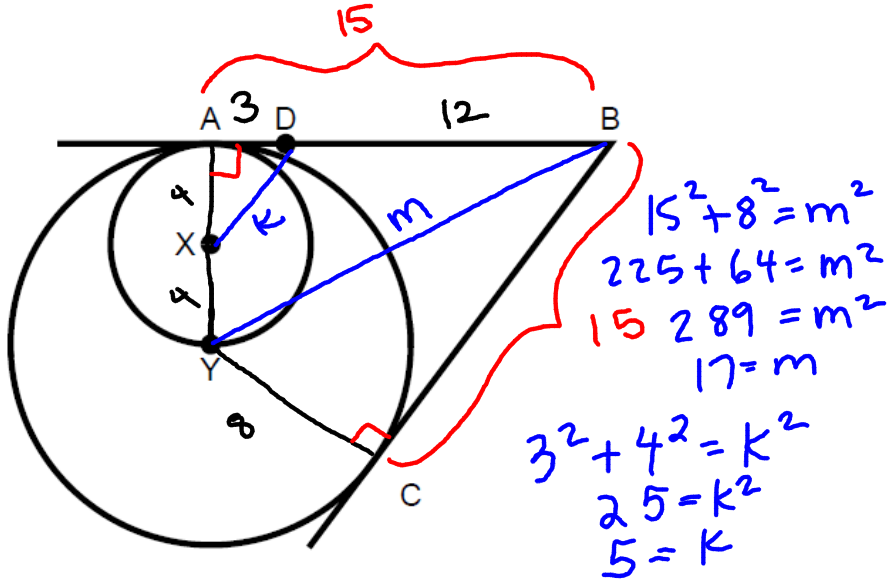
A common *external* tangent does *not* intersect the segment joining the centers.

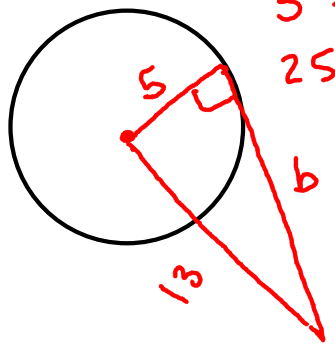


A circle can be tangent to a line, but it can also be tangent to another circle both internally or externally. **Tangent circles** are coplanar circles that are tangent to the same line at the same point.



Example 1: In the diagram below , ⊙X and ⊙Y are tangent at A. $\overline{AB}$ and $\overline{BC}$ are tangents to ⊙Y (A and C are the points of tangency). ⊙Y has diameter 16, AD = 3, and BD = 12.



① 

$5^2 + b^2 = 13^2$

$25 + b^2 = 169$

$b^2 = 144$

$b = 12$